ZAVARINA, M. V.

Atmosfera (The Atmosphere), by M. V. Zavarina, Leningrad, Gidrometeorologicheskoye Izdatel'stvo, 1956, pp 85-87

The author discusses "the effect of atomic explosions on the condition of the troposphere," taking into consideration the conflicting findings of American scientists "that atomic explosions cannot exert any substantial influence on the weather" on the one hand, and Italian and Japanese scientists on the other. He adds that "for the present it is difficult to say who is right but it can be confirmed that atomic explosions unquestionably exert some kind of influence on the state of the troposphere." "The extent of the influence of a single blast has not yet been determined."

The author gives data on the relative amount of energy released by an atomic blast and that released by natural meteorological disturbances and changes such as precipitation, storms, and solar radiation.

"The cited qualitative computations show that it is possible, with the aid of an atomic explosion, to exert an influence on tropical cyclones ...and on tornadoes. However it is difficult to predict whether the weather will be improved as a result of action against these phenomena."

SUM. 1287 Bibliography p 120

ZAVARINA, M.V.; ROMASHOVA, M.K.

Thickness of clouds over Arctic seas and central Arctic.
Probl. Arkt. no.2:127-132 '57.
(Arctic regions--Clouds) (MIRA 11:12)

ZAVARINA, M.V.

3(7) PHASE I BOOK EXPLOITATION SOV/2547

Leningrad. Glavnaya geofizicheskaya observatoriya

Voprosy dinamicheskoy meteorologii (Problems in Dynamic Meteorology) Leningrad, Gidrometeoizdat, 1959. 91 p. (Series: Its Trudy, vyp. 81) Errata slip inserted. 1,200 copies printed.

Sponsoring Agency: Glavnoye upravleniye gidrometeorologicheskoy sluzhby pri Sovete Ministrov SSSR.

Ed. (Title page): M.I. Yudin, Doctor of Physical and Mathematical Sciences and M.Ye. Shvets, Doctor of Physical and Mathematical Sciences; Ed. (inside book): L.P. Zhdanova; Tech. Ed.: O.G. Vladimirov.

PURPOSE: This issue of the Geophysical Institute's Transactions is intended for scientific workers and specialists in dynamic and synoptic meteorology.

COVERAGE: This collection of articles treats problems in dynamic meteorology. The articles, for the most part, discuss computation methods of forecasting meteorologic elements. Closely related to this is a study aimed at determining vertical velocities according to aircraft vibration data. No personalities are mentioned. References accompany each article.

ZAVARINA, M.V.

3(8)

PHASE I BOOK EXPLOITATION SOV/2268

Glavnaya geofizicheskaya observatoriya

Voprosy fiziki atmosfery (Problems in Physics of the Atmosphere) Leningrad, Gidrometeoizdat, 1959. 74 p. (Series: Its: Trudy, vyp. 82) Errata slip inserted. 1,250 copies printed.

Sponsoring Agency: Glavnoye upravleniye gidrometeorologicheskoy sluzhby pri Sovete Ministrov SSSR.

Ed. (Title page): N. S. Shishkin, Doctor of Physical and Mathematical Sciences; Ed. (Inside book): T. V. Ushakova; Tech. Ed.: M. I. Braynina.

PURPOSE: This issue of the Observatory's Transactions is intended for students and teachers of synoptic meteorology as well as for professionals in the field.

COVERAGE: This collection of articles is mainly concerned with the results of investigations on the physics of the atmosphere carried out in 1956-57 at the GGO, Division for the Physics of Free Atmosphere. The authors discuss the development (formation) and disintegration of convective clouds

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and the relationship between the cloud structure and aircraft icing. A new method of affecting supercooled clouds is described. One article is devoted to an analysis of the frontal structure of anticyclones. References accompany each article.

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Problems in Physics (Cont.)

AVAILABLE: Library of Congress

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10-9-59

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ZAVARINA, M.V.; DYUZHEVA, O.G.

Horizontal extent of clouds in the Arctic. Probl.Arkt. no.6: 71-80 '59. (MIRA 13:6)

1. Leningradskiy gidrometeorologicheskiy institut.
(Arctic regions--Clouds)

ZAVARINA, M.V.; ROMASHEVA, M.K.

Height of the lower limit of clouds over the Arctic. Trudy AANII 217:99-121 '59. (MIRA 13:2)
(Arctic regions--Clouds)

67175

3.9000
~~3(7), 1(12)~~

S/050/60/000/02/001/016
B007/B005

AUTHORS: Zavarina, M. V., Yudin, M. I.

TITLE: Accurate Definition and Use of the Richardson Number for the Identification of the Bump Zones of Aircraft

PERIODICAL: Meteorologiya i gidrologiya, 1960, Nr 2, pp 3-10 (USSR)

ABSTRACT: A physical interpretation of the Richardson number is given first, and it is pointed out that in recent years it has been widely used for forecasting the bump zones of aircraft (Refs 6,7,8). If Ri is less than unity, it may be regarded as an indicator for the level of turbulent energy (Ref 10). If it is assumed that the aircraft bump occurs at a very highly developed turbulence, a Ri number considerably less than unity must be the necessary condition for the origin of turbulence. In calculating Ri in zones of increased turbulence causing the bump, some authors obtained Ri < 1 (Refs 12,14) and others Ri > 1 (Refs 2,8). The present paper has the purpose of clarifying this apparent contradiction. The causes of this contradiction are as follows: 1) In a number of cases, the Richardson number is not determined for the atmospheric layers where the aircraft bump was observed. 2) In calculating Ri by aerological data,

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Accurate Definition and Use of the Richardson Number for the Identification of the Bump Zones of Aircraft

the derivatives in formula (2) for the energy transformation are replaced by finite differences. Here, the authors average these differences by layers of different thickness - from some hundreds of meters up to some kilometers. Formula (11) is derived. It expresses the relation between the Ri number and the averaging thickness L. This formula shows that it is possible to obtain $Ri < 1$ and $Ri > 1$ for the same turbulent state of the atmosphere. $Ri < 1$ is obtained in the case of a small averaging scale. $Ri > 1$ is obtained at an averaging scale exceeding a certain value of L_{max} (maximum scale of turbulence). 3) In calculating the Richardson numbers, an important source of turbulent energy - heat of condensation - has not been considered up to date. In investigating the cloud layers, it is necessary to renounce the adiabatic course of processes, and introduce the moist-adiabatic lapse rate γ_m instead of the dry-adiabatic lapse rate γ_d. These 3 points should be considered in the calculations. Thus, the authors attained a high probability factor in determining the aircraft bump zone. The evaluation was carried out by means of the probability coef-

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Accurate Definition and Use of the Richardson Number for the Identification of the Bump Zones of Aircraft

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B007/B005

ficient Q suggested by A. M. Obukhov (Ref 5): Formula (14). Figure 1 shows a diagram which was drawn on the basis of aircraft- and radio-balloon observations made in Minsk for 2 years (in April). It shows that the Richardson number can be used to determine the possibility of bump development. It is pointed out that Ri is mainly used to determine the turbulent state of the atmosphere. The idea that a bump only develops under the influence of turbulence is not quite exact. The wave motions on the interface may also be the cause of the bump. There are 1 figure and 15 references, 11 of which are Soviet.

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31307
S/124/61/000/010/042/056
D251/D301

10.1240

AUTHOR: Zavarina, M.V.

TITLE: Some characteristics of atmospheric turbulence inducing yawling in aircraft

PERIODICAL: Referativnyy zhurnal. Mekhanika, no. 10, 1961, 99, abstract 10 B686 (Tr. Leningr. gidrometeorol. in-ta, 1960, no. 9, 93-110)

TEXT: Analysis is given of aircraft lift with complete detection and measurement of yawling at four points in the USSR - Minsk, Sverdlovsk, Alma-Ata and Novosibirsk in the years 1953-54. The yawling was registered by an accelerometer. The intensity of yawling was estimated by the following scale: with an overload less than 0.2 g the intensity is weak, $0.2\ g < n < 0.5\ g$ - moderate, $n > 0.5\ g$ - strong. For the test an ЛИ-2 (LI-2) aircraft was used. Overloads of either sign were considered equally likely. It is shown that in the majority of cases weak yawling is most probable

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31307
S/124/61/000/010/042/056
D251/D301

Some characteristics...

(flights in cumulus clouds being excluded). The daily recurrence process could not be demonstrated in the absence of test flights at night. The annual scheme of yawling probability was different in different regions and seasonal maxima of yawling recurrence were observed in the different regions. The predomiant number of cases of yawling were observed with a vertical temperature gradient increasing 0.6° per 100 m. It was observed that the vertical gradient of the wind had a large effect on the recurrence of yawling and its intensity. Yawling was shown to be most probable in clouds, with different probabilities of yawling for different types of clouds. A table for the recurrence of yawling in different types of clouds according to the test points is given. It is shown that yawling occurs very rarely above clouds. Below clouds the probability of yawling is high. [Abstracter's note: Complete translation]

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ZAVARINA, M.V.

Studying geographical distribution of the probability of zones of increased turbulence affecting aircraft. Trudy NIIAK no.14:49-58 '61. (MIRA 15:1)

1. Glavnaya geofizicheskaya observatoriya.
(Atmospheric turbulence) (Meteorology in aeronautics)

S/169/61/000/011/054/065
D228/D304

AUTHOR: Zavarina, M.V., and Kurbatova, A.V.

TITLE: Aeroclimatic characteristics of the upper cloud boundary

PERIODICAL: Referativnyy zhurnal, Geofizika, no. 11, 1961, 47, abstract 11B321 (Tr. N.-i. in-ta aeroklimatol., no. 14, 1961, 59 - 68)

TEXT: The data of aircraft soundings for two years, carried out at Leningrad, Moscow and Odessa, form the basis of the work. Sc clouds were observed most of all. The frequency of Ac and Sc clouds was incompletely defined, since the aircraft did not always reach their upper boundary. Comparison of the data for Leningrad and Odessa shows that no substantial difference is observed on the whole between the north-west and the south of the USSR's European territory; however, at Odessa Sc, As, and Ns clouds are situated somewhat higher than over Leningrad. At Leningrad the altitude of the upper boundary of Sc, As, and Ns clouds in spring and summer, and of Ac

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clouds in summer and autumn, is higher than at Odessa. In winter, apart from St, the altitude of all forms of clouds over Odessa is higher than above Leningrad. For an average year the height of the lower cloud boundary at Odessa is greater than at Leningrad; with the exception of St, however, the height of the upper boundary of clouds is almost identical. In the absence of an adequate number of soundings for Cb clouds there are no grounds for judging their thickness. Ns possess the greatest thickness out of the other clouds. Positive temperature gradients of about 0.5 - 0.7° per 100 m - which gradually decrease as the upper boundary is approached and which are, at times, terminated here by an inversion that is most frequent and considerable over the upper cloud boundary - are observed beneath clouds and within them. Temperature inversions are most customary over St and Sc clouds, but are very rare over Ns and As. The average size of the inversion layer does not exceed 200 m. Cases of positive temperature gradients over clouds usually happen when yet another series of cloud layers is situated above them. The relative humidity u generally grows above the clouds and in them, reaching maximum values that are greatest in summer and least

Aeroclimatic characteristics of ... S/169/61/000/011/054/065
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in winter at the upper cloud boundary. For the cloud forms u reaches the greatest values at the upper boundary of St and Sc (up to 94 - 100 %) and the smallest values at the upper boundary of Cu (74 - 89 %). The growth of u diminishes according to the measure of approach to the upper boundary and sometimes quite ceases, too, and even gives place to its decrease (Ns, As, Cb). The decrease of u is mostly observed above the clouds, or else it remains unchanged. [Abstractor's note: Complete translation].

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ZAVARINA, M.V.; YEMEL'YANOVA, M.Z.

Results of experimental forecasting of turbulence for airplanes traveling along routes of the European territory of the U.S.S.R. Trudy GGO no.121:103-108 '61. (MIRA 15:5)
(Atmospheric turbulence) (Meteorology in aeronautics)

ZAVARIHA, M.V.

Academician M.A. Rykachev's life and work. Trudy GGO no.123: 3-10 '61. (MIRA 14:8)
(Rykachev, Mikhail Aleksandrovich, 1840-1919)

ZAVARINA, M.V.

Method of detecting and forecasting zones of increased turbulence at high levels. Trudy GGO no.123:119-126 '61.
(MIRA 14:8)
(Atmospheric turbulence)

ZAVARINA, M.V.

Diurnal variation of the probability of zones of high turbulence at high altitudes. Trudy GGO no.131:45-51 '62. (MIRA 15:6)
(Atmospheric turbulence)

ZAVARINA, Mariya Vasil'yevna; YUDIN, Mikhail Isaakovich. Prinimali uchastiye: DMITRIYEVA-ARRAGO, L.R.; LOBANOVA, V.Ya.; BELOUSOV, S.L.; ZELIKOVSKIY, V.E.; POKROVSKAYA, T.V., otv. red.; GONDIN, L.S., otv. red.; VLASOVA, Yu.V., red.; IVKOVA, G.V., tekhn. red.

[Calculating machines and their use in meteorology and climatology] Schetnye mashiny i ikh ispol'zovanie v meteorologii i klimatologii. Leningrad, Gidrometeor. izd-vo, 1963. 263 p. (MIRA 17:3)

ACCESSION NR: AT4002659 S/2531/63/000/149/0029/0034

AUTHOR: Zavarina, M. V.

TITLE: Aircraft bumping probability at various wind velocities

SOURCE: Leningrad. Glavnaya geofizicheskaya observatoriya. Trudy*, no. 149, 1963. Voprosy* prikladnoy klimatologii, 29-34

TOPIC TAGS: aircraft bumping, tropospheric turbulence

ABSTRACT: An attempt has been made to establish the statistical relationship between bumping probability of aircraft and wind velocity. Bumping incidence and intensity was estimated by flight personnel and tended to be subjective. A total of 2612 flight logs was evaluated: 1334 from propeller driven planes flying in the lower layers of the atmosphere and 1278 from jets flying in the upper atmosphere. The following conclusions were drawn from these data: 1) bumping probability increases with increasing wind velocity, especially with wind velocities above 30 m/sec, which occur only in the upper atmosphere; 2) bumping probability is twice as great in high clouds as it is in low clouds in high winds; 3) bumping probability in noncloudy

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ACCESSION NR: AT4002659

regions in the lower troposphere is not related to wind velocity, whereas it is related to wind velocity in the higher layers; 4) bumping probability is three times greater with wind velocities of 21—30 m/sec than it is at 10 m/sec; and 5) bumping probability in the upper layers of the atmosphere is 50% with a wind velocity of 10 m/sec and 75% at 20 m/sec. The main factor which increases bumping probability is not increased wind velocity but the presence of clouds. Orig. art. has: 1 table.

ASSOCIATION: none

SUBMITTED: 00 DATE ACQ: 14Jan64 ENCL: 00

SUB CODE: AS NO REF SOV: 009 OTHER: 008

Card 2/2

ACCESSION NR: AT4030526 S/0000/63/000/000/0053/0058

AUTHOR: Zavarina, M. V.; Yemel'yanova, M. Z.

TITLE: Experimental forecasts of aircraft bumping using an improved Richardson criterion

SOURCE: Nauchnaya konferentsiya po aviatsionnoy meteorologii. Moscow, 1960. Materialy*. Moscow, Gidrometeoizdat, 1963, 53-58

TOPIC TAGS: aircraft bumping forecasting, air turbulence, clear air turbulence

ABSTRACT: Experimental aircraft bumping forecasts were carried out by the Leningrad Meteorological Station (June 1950 to June 1960) and by the Vnukovo (Moscow) Aerometeorological Station (May-June 1960) using a more precise Richardson number, Ri, which is expressed as

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$$Ri = \frac{g}{T} \frac{\gamma_d - \gamma}{\left(\frac{\partial u}{\partial z}\right)^2 + \left(\frac{\partial v}{\partial z}\right)^2},$$

when the flight takes place in clear weather; and in cloudy conditions, as

$$R_i = \frac{g}{T} \frac{\gamma_m - \gamma}{\left(\frac{\partial u}{\partial z}\right)^2 + \left(\frac{\partial v}{\partial z}\right)^2}$$

Here, g is gravity acceleration, T is the mean temperature of the layer of air for which Ri is computed; γ_d is the dry-adiabatic air temperature gradient, γ_m is the moist-adiabatic gradient, γ is the observed temperature gradient in the given layer, and

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$$\left(\frac{\partial u}{\partial z}\right)^2+\left(\frac{\partial v}{\partial z}\right)^2\approx\left(\frac{\overline{\Delta v}}{\Delta z}\right)^2$$

is the squared gradient of the wind velocity vector. These forecasts were evaluated by computing the rate of correct prediction for the presence or absence of bumping, the number of undetected cases, and the degree (coefficient) of prediction accuracy using the Obukhov criterion. The lowest percentage of correct predictions was for the winter season: 67% correct for the lower layer of the atmosphere and 58% for the upper layer. These values are, however, based on a small number of bumpy flights and therefore may not be representative. The prediction of flights without bumping proved to be over 90% correct on an annual basis. Forecasting was also more accurate for propeller-driven planes flying at an altitute of not over 3.5 km than for the higher flying jet planes. The obtained values confirm the theory that low-level turbulence

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ACCESSION NR: AT4030526

(R>2) may be of longer duration than high-level turbulence where R assumes the critical value $(R)_{y} \leq 2$. This in turn determines the range of forecasting, in this case, 6—9 hr. Orig. art. has: 4 tables and 3 formulas.

ASSOCIATION: none

SUBMITTED: 18Feb63 DATE ACQ: 17Apr64 ENCL: 00

SUB CODE: AC, ES NO REF SOV: 005 OTHER: 000

Card 4/4

ZAVARINA, M.V., prof.

Climatic norms and the optimum period of observations. Meteor. i gidrol. no.2:44-47 F '66. (MIRA 19:1)

1. Glavnaya geofizicheskaya observatoriya. Submitted August 10, 1965.

ZAVARINA, M.V.

Evolution of the cloudiness of cold fronts in the warm season. (MIRA 18:8)
Trudy GGO no.176:98-113 '65.

ZAVARINA, M.V., doktor geograf, nauk

Exact calculation of the Richardson number and the probability of zones of high turbulence. Trudy GGO no.161:46-59 '64. (MIRA 17:9)

L 10866-66 EWT(1)/FA/EWP(v), FSC/T-2 GW

ACCESSION NR: AT5013224 UR/2531/65/000/178/0042/0053

AUTHOR: Zavarina, M. V. (Dr. of geographical sciences) 44,55

TITLE: Frequency of zones of possible icing of aircraft over the northern part of the Atlantic Ocean

SOURCE: Leningrad. Glavnaya Geofizicheskaya observatoriya. Trudy, no. 178, 1965. Voprosy prikladnoy klimatologii (Problems in applied climatology), 42-53

TOPIC TAGS: aircraft icing zone, ice formation, aircraft icing, aircraft hazard

ABSTRACT: Data obtained by aerological stations conducting observations during the IGY and IGC in 1957-59 were supplemented with synoptic data for four months (January, April, July, October) of 1960-61, and served as the basis for the calculation of the frequency of zones of possible icing of aircraft. Two maxima of frequency of meteorological conditions conducive to the icing of aircraft were identified: one to the northeast of Iceland, the other near the southern coast of Greenland. Both maxima reflect the presence of maxima of frequency of an overcast caused by an intense cyclonic activity in these regions. In January, the frequency of zones of possible icing in the zone of the maximum located near Iceland reaches 70%; the actual probability of icing of propeller-driven aircraft is

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ACCESSION NR: AT5013224

about 60%. This probability decreases toward lower latitudes. During the summer, because of the prevalence of above-zero temperatures in the clouds, no frequency maximum is observed at the southern coast of Greenland. In October, the probability distribution of the zones of possible icing over the Atlantic Ocean is close to the distribution observed in July, but the absolute frequency values are greater than in July. Orig. art. has: 4 figures and 3 tables.

ASSOCIATION: Glavnaya geofizicheskaya observatoriya, Leningrad (Main Geophysical Observatory)

SUBMITTED: 00 ENCL: 00 SUB CODE: AC, ES

NO REF SOV: 000 OTHER: 000

Card 2/2

ZAVARINSKIY, F.A., inzh.

Construction of local roads in Moscow Province. Avt.dor. 25 no.4:7 Ap '62. (MIRA 15:5)
(Moscow Province--Road construction)

87904

S/181/60/002/012/003/019
B006/B063

9.4300 (1143, 1155)

AUTHOR: Zavaritskaya, E. I.

TITLE: Thermal Effects in Tests of the Electrical Conductivity of Germanium in Liquid Helium

PERIODICAL: Fizika tverdogo tela, 1960, Vol. 2, No. 12, pp. 3009-3011

TEXT: This is a report on studies of the voltage-current characteristics of germanium alloyed with elements of the third and fifth groups at the temperature of liquid helium. The well-known fact that a sudden, reversible current increase occurs at about 5v/cm (low-temperature breakdown) was ascribed to impact ionization of impurity ions. Studies of germanium at the temperature of liquid helium and at voltages higher than 5v/cm (V_{lim}) have shown that the reversibility and monotonity of the characteristics may be disturbed. As shown in Fig. 1 and 2, there may be jumps. A sharp rise starts at $V=V_{lim}$, whose monotonic course is interrupted by a jump-like increase. Fig. 2 shows the volt-ampere characteristic as a function of temperature; this is an irreversible effect, and a hysteresis effect

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87904

Thermal Effects in Tests of the Electrical Conductivity of Germanium in Liquid Helium

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B006/B063

appears with a drop of voltage. Numerical results are collected in a table. The results obtained for the critical power agree with those obtained by P. G. Strelkov from optical observations. B. M. Vul is thanked for interest and discussions. There are 2 figures, 1 table, and 2 references: 1 Soviet and 1 US.

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva Moskva (Institute of Physics imeni P. N. Lebedev, Moscow)

SUBMITTED: April 8, 1960

Legend to the Table: 1) Number of specimen; 2) resistivity at 300°K ϱ, ohm·cm; 3) size of specimen, mm; 4) area of scattering surface S, cm^2; 5) critical power (at which current and temperature show jumps) W_k, watts; 6) temperature of specimen T, °K.

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Thermal Effects in Tests of the Electrical Conductivity of Germanium in Liquid Helium

S/181/60/002/012/003/018
B006/B063

3010 Э. И. Заварицкая

Номер образца 1	$\rho_{300°K}$, ом·см 2	Размеры образца, мм 3	Площадь рассеивающей поверхности S, см² 4	Критическая мощность $W_к$, вт 5	$\frac{W_к}{S}$	Температура образца T, °K 6
1	50	6 × 6 × 0.48	0.84	0.39	0.465	9
2	50	6 × 6 × 1.5	1.0	0.44	0.44	10
3	40	8 × 2 × 2	0.72	0.36	0.50	10
4	40	4 × 2.1 × 1	0.29	0.12	0.41	6
				1.0	3.0	40—50
					1.33	20—30
5	7	20 × 3.8 × 0.87	1.95	2.6	1.25	20—25
6	1	3.6 × 1.25 × 0.75	0.16	0.2	0.47	10
7	35	25 × 20 × 0.9	10.6	5		

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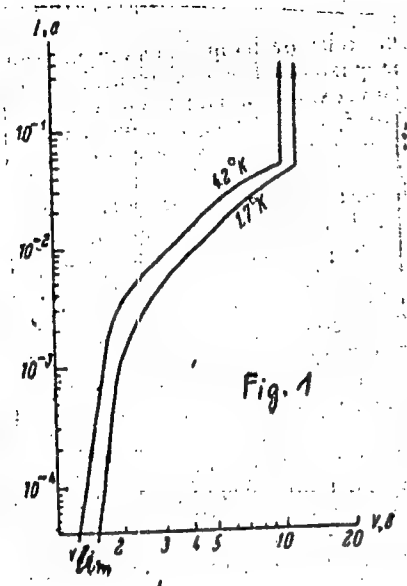

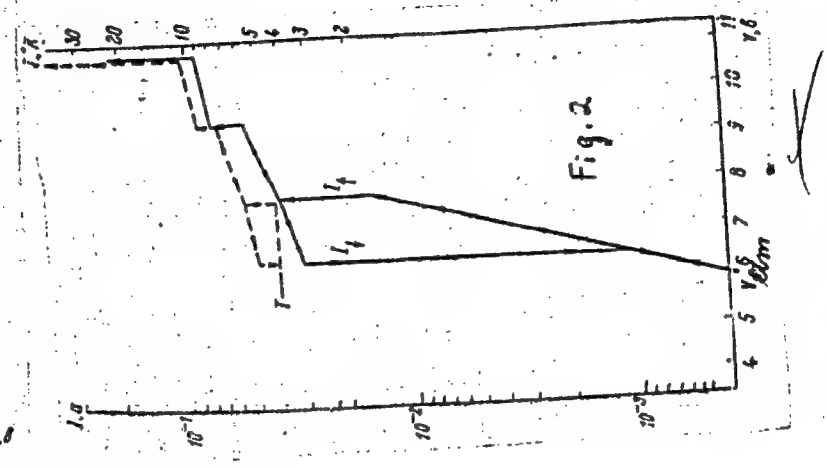

Card 4/4

VUL, B.M.; ZAVARITSKAYA, E.I.

Capacitance of p - n junctions at low temperatures. Zhur. eksp. i teor. fiz. 38 no.1:10-17 Jan '60. (MIRA 14:9)
(Materials at low temperatures) (Junction transistors)

87397

9,4300 (3203, 1043, 1143)
24.7700 2407, 1035, 1135

S/020/60/135/006/012/037
B019/B056

AUTHORS: Vul, B. M., Corresponding Member AS USSR, Zavaritskaya, E. I., and Keldysh, L. V.

TITLE: Impurity Conductivity of Germanium at Low Temperatures

PERIODICAL: Doklady Akademii nauk SSSR, 1960, Vol. 135, No. 6, pp. 1361-1363

TEXT: At temperatures $T \ll \varepsilon_i/k$, where ε_i is the impurity ionization energy and k the Boltzmann constant, the electrical conductivity of semiconductors is very low. If the field strength is increased, the impact ionization increases, because the mean free path of the carriers is relatively great at low temperatures. As the impurity ionization energy is low (0.01 ev for the indium-doped p-type germanium considered here), impact ionization starts already at field strengths of some v/cm. The lower the temperature, the lower is the fraction of thermal ionization, as follows from the dependence of current density on field strength shown in Fig. 1. At the temperature of liquid helium, the hole concentration may be

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Impurity Conductivity of Germanium at Low Temperatures

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B019/B056

described by: $p = \frac{s(N_a - N_d) - rN_d}{r + s}$ (1), where s is the mean ionization probability, r the mean recombination probability, N_a the acceptor concentration, and A_d the donor concentration. As the increase in r with an increase of electron energy is much slower than that of s, the free hole concentration in the range of pre-breakdown field strength is determined largely by the exponential growth of the ionization rate. The drift rate as a complex function of field strength is discussed, and it is found that at high field strengths the sharp decrease in mobility at helium temperatures is connected with the occurrence of a large quantity of charge centers. Thereby, the fraction of Coulomb scattering in the total number of collisions per unit time increases. The authors thank V. A. Chuyenkov for a discussion. There are 3 figures and 6 references: 3 Soviet and 3 US.

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva Akademii nauk SSSR (Institute of Physics imeni P. N. Lebedev of the Academy of Sciences USSR)

SUBMITTED: August 31, 1960

Card 2/2

24932 S/181/61/003/006/029/031
B102/B214

9.4300

AUTHOR: Zavaritskaya, E. I.

TITLE: Collision ionization of impurities in germanium at low temperatures

PERIODICAL: Fizika tverdogo tela, v. 3, no. 6, 1961, 1887-1895

TEXT: While at very low temperatures almost all impurity atoms are neutral, they are ionized already at nitrogen temperature on account of thermal excitation. In germanium the impurities of 3rd and 5th groups are practically completely ionized. The ionization is caused not only by thermal vibrations but also by inelastic collisions with "hot" electrons or holes. The author investigated the process of impact ionization in electric fields of a strength greater than the breakdown field, and the present paper gives a report of the measurements and the results. The samples in the form of small plates or dumbbell were made of indium-doped germanium with resistivities of 35-25 ohm·cm at room temperature. The contacts were of pure indium. The Hall coefficient was measured in fields of 2000 oe. The hole concentration was calculated according to the

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formula $p = 1/Re$. $R = 1/pe$ holds only in strong magnetic fields; but at helium temperatures it holds from 1000 oe upwards, and at nitrogen temperature from 2000 oe upwards. In the samples investigated, the difference of concentrations of acceptors and donors was $N_A - N_D \cong 10^{14}$ cm^{-3}.

For the greater part, the measurements were made in an apparatus with pulsed operation (pulse length 3 and 100 μsec.) developed by B. F. Anufriyev and shown in Fig. 1. Table 2 gives the numerical results of a dumbbell-shaped sample with $N_A - N_D = 1 \cdot 10^{14}$ cm^{-3}, an electrode area of 4 mm^2, and a length of 10 mm. The results are graphically illustrated in almost all cases. It is found that if $E > E_b$ (E_b breakdown field strength) dj/dE decreases with increasing E, and the current density j is only weakly temperature dependent. For $4E_b < E < 7E_b$ j increases linearly with E; for $E > E_b$ j increases with E less than linearly. The lower the temperature, and the larger the role of thermal ionization as compared to the collision ionization, the larger is the function j(E). The Hall constant R was measured in liquid helium with 3 and 100-μsec pulses, and in nitrogen with 3-μsec pulses. It was found that in all cases $R \approx 1/e(N_A - N_D)$, for

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Collision ionization of impurities in...

$E \geqslant 20$ v/cm and $j \geqslant 20$ a/cm^2, i.e. under these assumptions the excess acceptor impurities are almost completely ionized. Measurements of the drift r... v as a function of E showed that at 78 and 4.2°K in fields $E > 20$ v/cm, v first increases proportional to E, then proportional to $\sim\sqrt{E}$, and finally to $\sim\sqrt[3]{E}$. For fields $E \leqslant E_b$ the j(E) curves and R were measured in direct current. For $E < E_b$ the mobility was calculated to be $\sim 2 \cdot 10^5$ cm^2/v·sec, a value which remains practically unchanged up to $E = E_b = 5$ v/cm. For $E = E_b$ v reaches the value 10^6 cm/sec. Also for $E = 4E_b$ $v \simeq 10^6$ cm/sec. v was calculated from $v = j/pe$; j was measured at $H = 0$ and p at $H = 2000$ oe. It was found that in the whole range of fields in which the carrier concentration increases the order of magnitude of v remains constant. Exact measurements showed, however, that for $0 < E < 100$ v/cm and $T = 78$°K, v increases with E slowly and linearly. For $T = 4.2$°K, v is a complicated function of E. In the last part of the paper an elementary theory of the effect studied is given and the following investigated: 1) Dependence of

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the mean carrier energy on E. It is found that if $\frac{p(\bar{\varepsilon})}{p_o} \ll \left(\frac{\bar{\varepsilon}}{\varepsilon_i}\right)^2$, then $\bar{\varepsilon} \simeq \alpha' E$, and $\alpha' = el_{ph}/\sqrt{2\gamma}$. If the scattering is predominantly due to the ionized impurities, $\bar{\varepsilon} \simeq \sqrt{(\alpha')^2 E^2 - p(\bar{\varepsilon})/p_o}$. 2) Dependence of the carrier concentration on the mean carrier energy. It is found that if $E > E_b$, $p(\bar{\varepsilon}) \simeq \frac{N_A - N_D}{1 + \frac{W_r(\bar{\varepsilon})}{W_i(\bar{\varepsilon})}}$, where W_i is the impact ionization probability and W_r the recombination probability. If $W_r(\bar{\varepsilon}) \approx$ constant, one obtains

$$p(\bar{\varepsilon}) \simeq \frac{N_A - N_D}{1 + \beta\left(\frac{\varepsilon}{\varepsilon_i}\right)^{-1/2} \exp\left(\frac{\varepsilon_i}{\bar{\varepsilon}}\right)} \qquad (13),$$

where $\beta = \frac{\sqrt{\pi}}{2}\frac{W_r}{W_{i0}}$, $W_{i0} \simeq \pi a_0^2 \sqrt{\frac{2\varepsilon_i}{m^*}}$. 3) Dependence of the carrier concentration

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and their drift rate on E. The results are shown in Fig. 8 and given by equation

$$\xi^2 = y^2 + \frac{a}{1+\beta y^{-1/2}\exp\left(\frac{1}{y}\right)}, \quad (14).$$

where $\xi = \frac{el_{ph}}{\sqrt{2\delta}\,\varepsilon_i}E$, $y = \frac{\varepsilon}{\varepsilon_i}$,

$$a = \frac{N_A - N_D}{p_0}, \quad \beta = \frac{\sqrt{\pi}}{2}\frac{W_r}{W_{i0}}.$$

$\eta = 1/(N_A - N_D)$, $\varphi = \sqrt{2m^*v/\delta\varepsilon_i}$. The author thanks B. M. Vul and L. V. Keldysh for their interest; B. F. Anufriyev, B. D. Kopylovskiy, N. V. Zhigalov, and I. V. Davydova for collaboration. There are 8 figures, 2 tables, and 10 references: 6 Soviet-bloc and 4 non-Soviet-bloc.

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva AN SSSR Moskva (Institute of Physics imeni P. N. Lebedev, AS USSR, Moscow)

SUBMITTED: October 14, 1960 (initially)
February 1, 1961 (after revision)

Card 5/7

ZAVARITSKAYA, E. I.

Dissertation defended for the degree of Candidate of Physicomathematical Sciences at the Technical Physics Institute imeni A. F. Ioffe in 1962:

"Shock Ionization of Impurities in Germanium at Helium Temperature."

Vest. Akad. Nauk SSSR. No. 4, Moscow, 1963, pages 119-145

S/181/63/005/004/022/047
B102/B186

AUTHORS: Vul, B. M., Zavaritskaya, E. I., and Davydova, I. V.

[illegible]-temperature breakdown of thin layers of germanium

[illegible]

ampere characteristics: those of the [illegible] increase of current and breakdown at $E_b \approx 5$ v/cm, with the highly compensated [illegible] breakdown sets in at much higher field strengths and is accompanied by [illegible]

S/181/63/005/004/022/047
B102/B186

...temperature breakdown of...

...strength at which the breakdown is sustained, E_b that at ...

which it sets in. For Ge with ... E_b is ...

and equals 5 v/cm up to 20 μ, even when the voltage is reduced to ... mv. For thicker and more highly compensated samples E_b = 22 v/cm and ... With thick bases of 2 - ... the breakdown voltage (U_b) is ...

further reduced U_b ...

$\gamma \simeq 10\%$, $(U_b - U_i)/U_i \ll 1$. U_b was measured with 24 samples of purer germanium films (½μ); 20 of it had a U_b of 10-11 mv, for four U_b was lower than U_i by ... for the latter T was reduced to 1.86°K U_b rose and approached U_i. This indicates that the steep current increase cannot be explained by tunnelling, but by an injection effect. There are 9 figures.

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva AN SSSR Moskva (Physics Institute [name] P. N. Lebedev AS USSR, Moscow)

S/181/63/005/004/022/047
B102/B186

[illegible] breakdown [illegible]

[illegible] 1962

Card 3/3

ACCESSION NR: AP4028461 S/0[illegible]/64/006/004/1235/1238

AUTHOR: Bagayev, V. S.; Berozashvili, Yu. N.; Vul, B. M.; Zavaritskaya, E. I.; Shotov, A. P.

TITLE: Recombination radiation mechanism in gallium arsenide

SOURCE: Fizika tverdogo tela, v. 6, no. 4, 1964, 1235-1238

TOPIC TAGS: laser, semiconductor laser, recombination radiation, injection laser, gallium arsenide laser, radiative recombination, radiative transition, interband transition, p n junction

ABSTRACT: The mechanism responsible for recombination radiation of GaAs injection lasers has been experimentally investigated by analyzing its spontaneous and stimulated emission spectra. The p-n junctions were prepared by diffusing zinc into GaAs with a Te concentration of 10^{17} to 2×10^{18} cm^{-3}. The carrier concentration in the n-region corresponded to a state of degeneracy. Visual observation of emission through an infrared microscope showed that radiation is emitted from the p-region, which extends for several microns. It was found

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ACCESSION NR: AP4028461

that line width and the maximum $h\nu_{max}$ in the spontaneous emission spectrum vary with impurity concentration and temperature. As the impurity content was increased, $h\nu_{max}$ was displaced toward greater energies. However, even for $N \approx 10^{17}$ cm^{-3}, $h\nu_{max}$ was 0.05 ev smaller than the width of the forbidden band of pure GaAs. At this value the difference between $h\nu_{max}$ and the energy of the forbidden band cannot be explained by a change in its width as a result of doping. Experimental data indicate that at 4.2 to 77 K the temperature dependence of recombination radiation intensity is weak, while at 300 K the intensity decreases sharply. This may be associated with filling of acceptor levels by electrons from the valence band. No broadening of the spontaneous line was observed when the injection current was increased. This shows that the spectral width is determined by the final states of the electrons due to radiative transitions. The results obtained can be best explained by radiative transitions of electrons from the conduction band, which merges with the donor levels, into the impurity acceptor band of zinc atoms.

ASSOCIATION: Fizicheskiy institut P. N. Lebedeva AN SSSR, Moscow (Physics Institute, AN SSSR)

Card 2/3

ACCESSION NR: AP4034919 S/0181/64/006/005/1399/1405

AUTHOR: Bagayev, V. S.; Berozashvili, Yu. N.; Vul, B. M.; Zavaritskaya, E. I.; Keldy*sh, L. V.; Shotov, A. P.

TITLE: Energy spectrum of strongly doped gallium arsenide

SOURCE: Fizika tverdogo tela, v. 6, no. 5, 1964, 1399-1405

TOPIC TAGS: gallium arsenide, recombination radiation, p-n junction, GaAs, GaAs p-n junction, semiconductor, band structure

ABSTRACT: The recombination radiation of gallium arsenide has been investigated at relatively low injection levels of charge carriers. The minority carriers were injected into a p-n junction prepared by diffusing zinc into GaAs with an initial Te concentration between 10^{17} and $2 \cdot 10^{18}$ per cm^3. The area of the p-n junction was of the order of 10^{-3} cm^2. Recombination radiation modulated at a frequency of 9 cps was recorded when thermal heating of the samples was negligible. The recombination radiation spectra of samples

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ACCESSION NR: AP4034919

measured at room temperature are almost identical. At lower temperatures, however, both the position of the maximum and the shape of the spectral lines are affected by the concentration of Te in the samples. At temperatures equal to 78 and 4.2K, the spectral lines spread into the lower energy region and terminate abruptly on the high energy side. Asymmetry of the curves increases as the temperature is decreased from 78 to 4.1K. It also increases with a larger concentration of Te impurity. At a Te concentration $\approx 10^{18}$ per cm^3, the maximum in the recombination spectrum is shifted toward the lower energy region as the injection current is decreased. It is shown that this displacement is caused by additional energy levels ("tail" in the density of states) in the valence band arising as a result of a large concentration of charged impurities distributed in a disorderly fashion.

ASSOCIATION: none

SUBMITTED: 20Nov63 DATE ACQ: 20May64 ENCL: 00

SUB CODE: PH NO REF SOV: 004 OTHER: 008

Card 2/2

ACCESSION NR: AP4034931 S/0181/64/006/005/1465/1471

AUTHOR: Vul, B. M.; Zavaritskaya, E. I.; Shotov, A. P.

TITLE: Current-voltage characteristics of p-n junctions in strongly doped gallium arsenide

SOURCE: Fizika tverdogo tela, v. 6, no. 5, 1964, 1465-1471

TOPIC TAGS: gallium arsenide, p-n junction, semiconductor, GaAs, band structure

ABSTRACT: The current-voltage characteristics of a GaAs p-n junction were investigated at 4.2, 77, and 290K. The samples with a transition region area of about 10^{-3} cm^2 were prepared by diffusing zinc into GaAs with a Te concentration on the order of 10^{17} and 10^{18} cm^{-3}. The current-voltage characteristics of different samples varied very slightly when the current exceeded 10^{-4} amp. A reverse bias breakdown was observed in all samples. The reverse voltage-current characteristics showed a smooth change of current with

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ACCESSION NR: AP4034931

voltage and were reversible without sudden changes of current. The direct voltage-current characteristics show that at sufficiently high currents the current varies linearly with the voltage. The data observed were explained by the complex structure of samples, that is, in the specimens used the degenerate n-type region apparently was in contact with the p-n junction while the degenerate p-side was several microns distant from the junction. In this intermediate area, Zn concentration was insufficiently high for merging of the impurity and valence bands to take place. It was determined that at a Te concentration of approximately 10^{18} cm^{-3} and at a temperature of 77K, the variation of current with voltage, directly at the junction region, coincides with the variation of the maximum in the recombination radiation spectrum with current. At T = 4.2K, this dependence is shifted by 0.03 ev. When the voltage at the p-n junction is less than the width of the forbidden band, the passage of current is determined by distortions in the energy structure of the bands caused

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ACCESSION NR: AP4034931

by fluctuations in the distribution of charged impurities. Orig. art. has: 10 figures, 1 table, and 5 formulas.

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva AN SSSR, Moscow (Physics Institute, AN SSSR)

SUBMITTED: 06Dec63 DATE ACQ: 20May64 ENCL: 00

SUB CODE: SS NO REF SOV: 005 OTHER: 008

Card 3/3

L 6324-65 EWT(m)/EPF(c)/EWP(i)/EWP(t)/EWP(b)/EWA(h) IJP(c) JD

ACCESSION NR: AP5019865 UR/0181/65/007/008/2459/2468

AUTHOR: Zavaritskaya, E. I.

TITLE: Electric discharge in thin layers of germanium at helium temperatures

SOURCE: Fizika tverdogo tela, v. 7, no. 8, 1965, 2459-2468

TOPIC TAGS: germanium, electric discharge, dielectric breakdown, impurity center, impact ionization, volt ampere characteristic

ABSTRACT: This is a continuation of earlier studies of electric breakdown at low temperatures occurring at ~4 K and connected with impact ionization of the neutral atoms of the impurity (with B. M. Vul and [illegible] Savydova, FTT v. 5, [illegible]). The purpose of the measurements was to check the earlier deduction that breakdown [illegible] impact ionization region from the cathode to the anode. [illegible] analyzes the [illegible] electric breakdown in thin samples of germanium alloyed with elements of Group III and V. The measurements were made on the same samples of p-type germanium as in the earlier work. The author analyzes the influence of the variation of the volt-ampere characteristic and the occurrence of breakdown with the value of the resistance connected in series with the circuit, the dependence of the current on the [illegible]ge for different samples, and the effect of pulsed voltages of different lengths on the breakdown. It is demonstrated that

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L 6324-66

ACCESSION NR: AP5019865

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the phenomenon is similar to a gas discharge in that the discharge is accompanied by electrostatic ionization of the impurity in the anode-drop region. The causes of differences between samples are discussed. "The author thanks B. M. Vul and L. V. Keldysh for valuable discussions." Orig. art. has: 5 figures, 2 formulas, and 4 tables.

ASSOCIATION: Fizicheskiy institut im. P. N. Lebedeva AN SSSR, Moscow (Physics Institute AN SSSR)

SUBMITTED: 18Mar65 ENCL: 00 SUB CODE: SS

NR REF SOV: 004 OTHER: 005

nw

Card 2/2

L 25487-66 EWT(m) JD/JG

ACC NR: AP6009680 SOURCE CODE: UR/0181/66/008/003/0888/0893

62
56
8

AUTHOR: Vul, B. M.; Zavaritskaya, E. I.; Zavaritskiy, N. V.

ORG: Physics Institute im. P. N. Lebedev, AN SSSR, Moscow (Fizicheskiy institut AN [illegible])

TITLE: Tunnel effect in diodes of gallium arsenide at low temperatures

SOURCE: Fizika tverdogo tela, v. 8, no. 3, 1966, 888-893

TOPIC TAGS: gallium arsenide, tunnel effect, volt ampere characteristic, tunnel diode, temperature dependence, electron distribution

ABSTRACT: The purpose of the investigation was to determine the features and characteristics of tunnel diodes near zero voltage. The measurements were made with GaAs tunnel diodes with hole density from 3×10^{19} to 8×10^{19} cm^{-3}, at temperatures 1--30K in a magnetic field up to 22 koe. Plots of the current I against the voltage V, of dV/dI against V, and $d^2V/dI^2(V)$ were obtained. The I(V) and dV/dI(V) plots were obtained by a procedure described earlier (ZhETF v. 45, 1839, 1963), and d^2V/dI^2 was determined by doubling the frequency of the signal. The results have shown that at temperatures below 25K the dV/dI(V) curve has near V = 0 a maximum whose relative magnitude increases logarithmically with decreasing temperature, reaching 2 % at [illegible]

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L 25487-66

ACC NR: AP6009680

presence of the singularity in the electron energy distribution function as V approaches zero. It is shown that the results of the experiment may be greatly distorted by the influence of the tunnel junction between the degenerate semiconductor and a superconductor at the location of the ohmic contact. The authors thank I. L. Kapitsa for interest in the work, L. V. Keldysh and Yu. B. Kopayev for valuable discussions, and S. S. Meskir, V. N. Ravich, and M. I. Krendel' for supplying the tunnel diodes. Orig. art. has: 9 figures and 2 formulas.

SUB CODE: 20/ SUBM DATE: 07Aug65/ ORIG REF: 002/ OTH REF: 005

Card 2/2

TERPIGOREVA, Vera Dmitriyevna; MATVEYEV, Sergey Dmitriyevich; ZAVARITSKAYA, Marianna Aleksandrovna; GELYUTA, Ye.Z., otvetstvennyy redaktor; KHODNEVA, I.V., redaktor izdatel'stva; ALADOVA, Ye.I., tekhnicheskiy redaktor

Geology. Moskva, Ugletekhizdat [Text in English with English-Russian dictionary.] Pt.1. 1956. 73 p. (MLRA 10:2)
(Geology--Terminology)

TERPIGOREVA, Vera Dmitriyevna; ZAVARITSKAYA, Marianna Aleksandrovna; SHESHKO, Ye.F., otvetstvennyy redaktor; ALADOVA, Ye.I., tekhnicheskiy redaktor

[Open-cut coal mining. Manual for translating English mining literature into Russian] Dobycha uglia otkrytym sposobom; uchebnoe posobie po perevodu s angliiskogo na russkii iazyk gorno-tekhnicheskoy literatury. Moskva, Ugletekhizdat. Vol. 4. 1956. 197 p. (MLRA 9:12)
(English language--Translating)
(Coal mines and mining--Terminology)

ZAVARITSKAYA, T. A. Oct 52

USSR/Physics - Particle Size Determination

"Determination of the True Specific Surface of Solid Dispersoids by the Method of Air Filtration," T. A. Zavaritskaya and O. N. Grigrov, All-Union Aluminum-Magnesium Inst, Leningrad

DAN SSSR, Vol 86, No 4, pp 757-758

Data obtained by B. V. Deryagin's method for detg particle size by passing air through the powder were compared with results obtained by calcn and found to be satisfactory. Presented by Acad P. A. Rebinder 7 Jul 52.

Source #264T100

TSAREV, V.A.; ZAVARITSKIY, N.V.

Magnetic properties of ferromagnetic dielectrics (spinels) at low temperatures. Zhur.eksp. i teor.fiz. 47 no.6:2102-2110 D '64. (MIRA 18:2)

1. Institut fizicheskikh problem AN SSSR i Institut fiziki tverdogo tela AN SSSR.

TSAREV, V.A.; ZAVARITSKIY, N.V.

Applicability of spin wave theory to ferromagnetic metals. Zhur. eksp. i teor. fiz. 48 no.1:125-129 Ja '65. (MIRA 18:4)

1. Institut fizicheskikh problem AN SSSR.

L 6465-66 EWT(1) IJP(c) GG

ACC NR: AI5025254 SOURCE CODE: UR/0386/65/002/004/0168/0171

AUTHOR: Zavaritskiy, N. V. 44,55 68

ORG: Institute of Physics Problems, Academy of Sciences SSSR (Institut fizicheskikh problem Akademii nauk SSSR)

TITLE: Concerning the quantization of the energy levels of electronic excitations in the intermediate state of a superconductor

SOURCE: Zhurnal eksperimental'noy i teoreticheskoy fiziki. Pis'ma v redaktsiyu (prilozheniye), v. 2, no. 4, 1965, 168-171

TOPIC TAGS: superconductivity, specific heat, electron energy level, thermal conduction

ABSTRACT: The investigation was undertaken to ascertain the extent to which quantization of the energy levels in the transition of a metal into the intermediate state decreases the specific heat C in the temperature region below the characteristic energy. The object of the investigation was a cylindrical single crystal 2.6 mm in diameter, made of tin with 10^{-4}% impurities. The measurements were made in the temperature interval 0.1--0.3K in magnetic fields corresponding to fractions $\eta \approx 0.08$, 0.15, 0.3, and 0.45 of the normal phase in the sample. The widths of the layers of this phase were 3×10^{-3}, 4×10^{-3}, 5×10^{-3}, and 8×10^{-3} cm, corresponding to critical transition temperatures [illegible] and [illegible] K. Measurements were made of the thermal conductivity K and the temperature conductivity a^2, from which the spe-

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L 6465-66

ACC NR: AP5025254

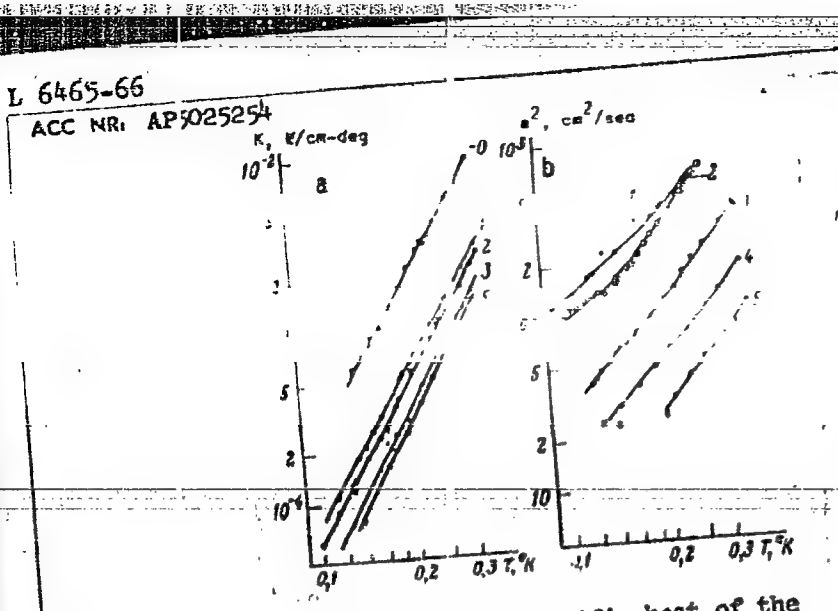

Fig. 1. a - Specific heat of the investigated sample, b - temperature conductivity of the investigated sample. The fraction of the normal phase in the sample is: 1 - superconducting state), 2 - η = 0.05, 3 - η = 0.15; 4 - η = 0.3; 5 - η = 0.45.

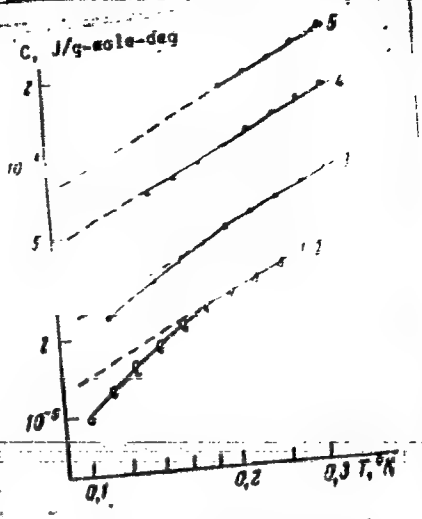

Fig. 2. Specific heat of tin in the intermediate state for different fractions of the normal phase. The notation is the same as in Fig. 1b, the dashed lines represent $C_n = a(\eta, T$.

6

critical that was calculated. The calculation and the method of measuring the thermal conductivity were the same as employed earlier (ZhETF v. 33, 1065, 1957; Progress of Cryogenics, London, 1959, p. 277). The results of the measurements (Fig. 1a) show that when [illegible] the change in the thermal conductivity on going over into the intermediate state, and consequently, the scattering of the phonons by the electrons, [illegible] the temperature drops from 0.3 to 0.1K. The temperature con- [illegible] of the temperature wave propagating [illegible] with frequency [illegible] measurement of a [illegible] The results of the measurement [illegible] was calculated from the curves [illegible] The specific heat of the investigated [illegible] The results (Fig. 2) show that below 0.2K the variation of the specific heat offers evidence of the appearance of quantization of the energy levels of the electronic excitations, and that the specific heat of a superconductor decreases in the intermediate state. Author is grateful to P. L. Kapitsa for interest in the work and to A. F. Andreyev for the results of his calculations prior to publication. Orig. art. has: 2 figures.

SUB CODE: GP, NP SUBM DATE: 16Jun65/ ORIG REF: 004/ OTH REF: 000

Card 3/3

ZAVARITSKIY, N.V.

Use of the tunnel effect in the study of tin. Part 2. Zhur. eksp. i teor. fiz. 48 no.3:837-844 Mr '65. (MIRA 18:6)

1. Institut fizicheskikh problem AN SSSR.

SOV/137-58-12-24325

Translation from: Referativnyy zhurnal. Metallurgiya, 1958, Nr 12, p 56 (USSR)

AUTHORS: Il'ichev, V. A., Zavaritskaya, T. A.

TITLE: Production of Titanium Tetrachloride (Proizvodstvo chetyrekhkhloristogo titana)

PERIODICAL: V sb.: Legkiye metally. Nr 4. Leningrad, 1957, pp 111-114

ABSTRACT: The results of basic studies of techniques for producing $TiCl_4$ from ilmenite concentrates are listed. The authors of the studies and the organizations where they were performed are identified.

M. M.

Card 1/1

137-58-6-11919

Translation from: Referativnyy zhurnal, Metallurgiya, 1958, Nr 6, p 105 (USSR)

AUTHOR: Zavaritskaya, T.A.

TITLE: Peculiarities of the Crystallization of Phosphorus and Vanadium Salts in Aluminate Solutions (Osobennosti kristallizatsii fosfornykh i vanadiyevykh soley v alyuminatnykh rastvorakh)

PERIODICAL: Tr. Vses. alyumin.-magn. in-ta, 1957, Nr 39, pp 109-114

ABSTRACT: In the treatment of certain types of bauxites by the Bayer method, P and V salts accumulate in the aluminate solutions, and this creates the necessity to remove these salts. This may be done by cooling the solutions to low temperatures. The results of the investigations show that in all cases in which crystallization proceeds without agitation or with slow agitation of the solution, spicular crystals or concretions thereof come into being, and this may call forth very serious complications in drawing them out of solution. When the process of crystallization is run with continuous agitation of the suspension, crystals of isometric form can be separated out. In aluminate solutions having a standard causticity of 3.4 and concentrations of 60, 120, and 240 g Na_2O caustic/liter, suspensions do not

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Peculiarities of the Crystallization (cont.)

form isometric crystals even at high supersaturation with salts and intensive stirring. Such crystals come into being only in aluminate solutions having concentrations of 300 g/liter Na_2O caustic or more. At low supersaturation (5 g P_2O_5/liter and 5 g V_2O_5/liter), most of the crystals that come down are 20-30 microns in size, while at 30 g P_2O_5 or V_2O_5/liter the precipitating crystals have a mean linear diameter which fluctuates from 200 to 400 microns.

I.G.

1. Phosphorus salts--Crystallization 2. Vanadium salts--Crystallization
3. Crystals--Separation 3. Aluminum ores--Processing

Card 2/2

TSEKHOVOL'SKAYA, D.I.; ZAVARITSKAYA, T.A.; Prinimala uchastiye: VOL'FRAM, I., diplomantka

Determination of some impurities in silicon tetrachloride by the method of infrared spectroscopy. Trudy Kom.anal.khim. 13:399-404 '63. (MIR 16:5)

1. Leningradskiy gosudarstvennyy universitet (for Vol'fram).
(Silicon chlorides--Absorption spectra)

SOV/136-58-10-10/27

AUTHORS: Zavaritskaya, T.A. and Pustovalova, S.S.

TITLE: Composition and Properties of Titanium Tetrachloride Hydrolysis Products Dissolved in Titanium Tetrachloride (Sostav i svoystva rastvorennykh v chetyrekhkhloristom titane produktov yego gidroliza)

PERIODICAL: Tsvetnyye Metally, 1958, Nr 10, pp 50 - 53 (USSR)

ABSTRACT: The object of the work described was to study the contamination of titanium tetrachloride by its hydrolysis products under industrial conditions. Compounds extracted from various samples or prepared artificially were used. From analyses and molecular-weight determinations, the material obtained by vacuum distillation corresponded to $TiOCl_2$. It was found (Figure 1) that titanium oxychloride decomposes at comparatively low temperatures, (80-100 °C). Its solubility in the tetrachloride was determined at 25 - 135 °C and supersaturation was detected. A special apparatus (Figure 3) was used to determine the boiling point of the saturated solution and the results are compared (Figure 4) with those given by N.K. Druzhinina for the vapour pressure of the pure tetrachloride - there is very little difference between the curves.

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SOV/136-58-10-10/27

Composition and Properties of Titanium Tetrachloride Hydrolysis Products Dissolved in Titanium Tetrachloride

The investigation has shown by comparative distillation and rectification tests at different pressures that the present practice of purifying the titanium tetrachloride used in the magnesium-thermic process should be replaced by vacuum distillation. The authors conclude that the main cause of hydrolysis-product contamination is contact with moist air. An editorial note states that the investigation should be continued with a wider temperature range. There are 4 figures and 1 English reference.

ASSOCIATION: VAMI

Card 2/2

SOV/32-25-3-16/62

5(4)
AUTHORS: Tsekhovol'skaya, D. I., Zavaritskaya, T. A., Denisov, G. S., Chulanovskiy, V. M.

TITLE: The Use of Infra-red Spectroscopy for Analysing Titanium Tetrachloride (Primeneniye infrakrasnoy spektroskopii k analizu chetyrekhkhloristogo titana)

PERIODICAL: Zavodskaya Laboratoriya, 1959, Vol 25, Nr 3, pp 300-302 (USSR)

ABSTRACT: A lecture on this investigation was given at the XII Vsesoyuznoye soveshchaniye po spektroskopii (Twelfth All Union Conference of Spectroscopy) in Moscow in November 1958. The properties of titanium depend considerably on the minimum amount of impurities. It is not possible to determine all admixtures of $TiCl_4$ by the chemical and physico-chemical analyses being used at present. In the present investigation the composition of various admixtures of $TiCl_4$ was investigated and methods of their quantitative determination by means of infra-red absorption spectra have been worked out. The spectrometers IKS-6, IKS-12, and Perkin Elmer 12-V were used in the investigations. Various technical samples of $TiCl_4$ showed a considerable amount of spectral bands which

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came from various admixtures, as e.g., $VOCl_3$, $SiCl_4$, $TiOCl_2$, C_6Cl_6, $CH_2ClCOCl$, $CHCl_2$, $COCl$, CCl_3COCl, HCl, $COCl_2$, CC_2. It was found that the hydrolysis of $TiCl_4$ proceeds with formation of oxychlorides of the type Ti-O-Ti and Ti=O and not of hydroxychlorides. The determinations of $VOCl_3$ and $COCl_2$ are given. CO_2 was determined from the maximum at $\nu = 2338cm^{-1}$, whereas chlorine-substituted acetylchlorides were determined from the oscillations of the C=O group. The solubility of CO_2, HCl, $COCl_2$, and C_6Cl_6 in $TiCl_4$ could be determined by means of the investigation results which also showed that, with a $TiCl_4$ excess, the hydrolysis proceeds according to the scheme $TiCl_4 + H_2O \longrightarrow TiOCl_2 + 2\,HCl$. There are 1 table and 5 references, 1 of which is Soviet.

ASSOCIATION: Vsesoyuznyy alyuminiyevo-magniyevyy institut (All-Union Aluminum-Magnesium Institute)

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S/180/60/000/004/006/027
E111/E452

18.3100

AUTHORS: Delarova, N.I., Zavaritskaya, T.A., Zevakin, I.A. and Tsekhovol'skaya, Z.I. (Leningrad)

TITLE: Impurities in Technical Titanium Tetrachloride and Their Removal

PERIODICAL: Izvestiya Akademii nauk SSSR, Otdeleniye tekhnicheskikh nauk, Metallurgiya i toplivo, 1960, No.4, pp.33-38

TEXT: The authors point out the influence of titanium-tetrachloride purity on that of titanium obtained from it. For investigating the nature of impurities in titanium tetrachloride the authors used infrared absorption spectra. The impurities in tetra-chloride obtained by chlorination of slags in stack electric furnaces, in melts and in a fluidized bed are shown in Table 1. The solubilities of the main impurities in titanium tetrachloride were determined, values in weight percent at 0 to 136°C being shown in Table 2 for HCl, CO_2, Cl_2 and $COCl_2$; solubilities of $TiOCl_2$ and C_6Cl_6 are shown as functions of temperature (-20 to +136°C) in Fig.1a and 1b respectively. The authors also checked the vapour-liquid equilibrium compositions for the system $TiCl_4$ - $SiCl_4$ (Fig.2a) and investigated equilibria in $TiCl_4$ - $VOCl_3$

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mixtures (Fig.2b) and $TiCl_4$ - CCl_3COCl mixtures (Fig.4). These results are shown in the form of composition of vapour phase as functions of that of the liquid phase, the relative volatility as a function of the concentration of volatile component in the liquid is shown in Fig.3a for $TiCl_4$ - $SiCl_4$, Fig.3b for $TiCl_4$ - $VOCl_3$ and Fig.5 for $TiCl_4$ - CCl_3COCl. The relative volatilities in $TiCl_4$ - $VOCl_3$ and $TiCl_4$ - CCl_3COCl are small and rectification columns with many plates would be required for their separation. Determinations were made of the partial vapour pressures of $TiOCl_2$ and C_6Cl_6 over their mixtures with $TiCl_4$ at 136 to 137°C by analyzing the condensed vapour phase in equilibrium with solution boiling at atmospheric pressure: the low values obtained (Tables 3 and 4 respectively) suggest that contamination by these substances is due largely to carry-over of droplets. There are 5 figures, 4 tables and 7 references: 5 Soviet, 1 English and 1 Japanese.

SUBMITTED: April 30, 1960

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S/080/60/033/009/016/021
A003/A001

AUTHORS: Zavaritskaya, T.A., Tsekhovol'skaya, D.I.

TITLE: On the Determination of Titanium Oxychloride in Titanium Tetrachloride

PERIODICAL: Zhurnal prikladnoy khimii, 1960, Vol. 33, No. 9, pp. 2139-2140

TEXT: For using titanium tetrachloride for metallurgical purposes its degree of pollution by oxychloride, $TiOCl_2$, must be known. The method of infrared absorption spectra shows the best results. G.S. Denisov found three absorption bands for solutions of titanium oxychloride in tetrachloride: 821, 1,184 and 1,356 cm^{-1}. The first band is very suitable for determining small quantities of oxychloride, because it is 100 times more intensive than the others. The work was carried out on a ИКС-12 (IKS-12) device with a NaCl prism. Results of investigations in the 1,356 cm^{-1} band are cited. The method mentioned is at present the only way of determining pollutions by oxychloride quickly. There is 1 figure, 1 table and 3 references: 2 Soviet, 1 American.

ASSOCIATION: Vsesoyuznyy alyuminiyevo-magniyevyy institut (All-Union Aluminum-Magnesium Institute)

SUBMITTED: February 18, 1960

Card 1/1

ZAVARITSKAYA, T.A.; Prinimali uchastiye: DEYAROVA, N.; TSEKHOVSKAYA, D.; ZEVAKIN, I.; MISHENEVA, Ye.; ROGATKIN, A.

Investigations in the field of titanium tetrachloride purification. Titan i ego splavy no.5:195-200 '61. (MIRA 15:2)
(Titanium chloride)
(Distillation)
(Vapor-liquid equilibrium)

S/137/62/000/006/041/163
A006/A101

AUTHOR: Zavaritskaya, T.A.

TITLE: Investigations in the field of refining titanium tetrachloride

PERIODICAL: Referativnyy zhurnal, Metallurgiya, no. 6, 1962, 15, abstract 60107 (In collection: "Titan i yego splavy", no. 5, Moscow, AN SSSR, 1961, 195 - 200)

TEXT: Besides inorganic admixtures ($SiCl_4$, $SOCl_2$, $VOCl_3$, $AlCl_3$, $TiOCl_2$ and others) the following organic impurities are dissolved in commercial $TiCl_4$: phosgene, hexachlorobenzene, CO_2, CS_2, chloracetyl chlorides, CCl_4; they can be determined by the method of molecular spectroscopy. The phosgene concentration in $TiCl_4$ varies between 0.005 to 2.0%; it can be fully eliminated by rectification. The solubility of hexachlorobenzene in $TiCl_4$ is sharply increased with higher temperature; it can be eliminated by distillation. The concentration of trichloracetyl chloride in commercial $TiCl_4$ is $< 0.005\%$. CS_2 is fully eliminated from $TiCl_4$ during rectification. The partial tension of $TiOCl_2$ vapor over a solution saturated at 136°C is insignificant; therefore $TiCl_4$ can be refined from dissolved $TiOCl_2$ by distillation with dephlegmation. The necessary equipment for

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the chemical refining of $TiCl_4$ from $VOCl_3$ has as yet not been developed. Tests will be made with a rectification column with downfall grids for refining $TiCl_4$ from $VOCl_3$.

L. Vorob'yeva

[Abstracter's note: Complete translation]

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3/598/61/000/005/009/010
D040/D113

AUTHOR: Zavaritskaya, T.A.

TITLE: Investigations on titanium tetrachloride refining

SOURCE: Akademiya nauk SSSR. Institut metallurgii. Titan i yego splavy, no. 5, Moscow, 1961. Metallurgiya i khimiya titana, 195-200

TEXT: This is a brief summary of data obtained by a group of Soviet researchers headed by the author. The presence of CS_2, C_6Cl_6 and CCl_4 has been detected in Soviet $TiCl_4$, in addition to $COCl_2$, CO_2 and chloroacetyl chlorides detected by U.S. researchers by means of infrared absorption spectra. Quantitative determination methods had to be developed for these organic impurities because none of the necessary data was available in Soviet and U.S. sources. The methods have been developed [Abstracter's note: No technical details are given] and have also permitted determining the solubility of impurities in $TiCl_4$. It has been found out that the $COCl_2$ content varied from 0.005 to 2.0% and its solubility decreased abruptly

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Investigation on titanium tetrachloride ...

with increasing temperature of $TiCl_4$; the CO_2 content did not exceed thousandths of one per cent; the usual CCl_3COCl content was not above 0.005%. $COCl_2$ could be almost completely eliminated by rectification, and C_6Cl_6 by distillation with dephlegmation; CS_2 disappeared in rectification; CCl_3COCl content higher than 0.005% required the use of rectifying towers with a high plate number. Anorganic $SOCl_2$ and $POCl_3$ impurities were also found and their content determined by infrared absorption spectra. The content of $TiOCl_2$ and $SiCl_4$ in $TiCl_4$ has been determined, and dissolved $TiOCl_2$ could be eliminated by distillation. An experimental distillation unit was tested at a plant in 1958, and proved good. No apparatus could yet be developed for eliminating vanadium oxychloride, and the practiced periodical separation of it from $TiCl_4$ causes high losses of $TiCl_4$. A sieve-plate rectifying tower will be tested in purifying $TiCl_4$ from $VOCl_3$. An inspection of industrial rectifying towers led to the conclusion that the sieve-plate type is better than the packed type. Tests of a bubble-plate type tower are planned. Schematic diagrams of apparatus, used for determining the partial pressure of $TiOCl_2$ vapors over $TiOCl_2$ mixtures with $TiCl_4$,

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and for investigating liquid-vapor equilibrium in $VOCl_3$ - $TiCl_4$, CCl_3COCl - $TiCl_4$ systems are included. There are 6 figures and 2 tables.

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TSEKHOVOL'SKAYA, D.I.; ZAVARITSKAYA, T.A.

Quantitative determination of some impurities in titanium tetrachloride by infrared spectroscopy. Zhur.anal.khim. 16 no.5:623-626 S-O '61. (MIRA 14:9)

1. All-Union Aluminium-Magnesium Institute, Leningrad.
(Titanium chloride) (Spectrum, Infrared)

S/080/61/034/012/014/017
D204/D305

AUTHORS: Zavaritskaya, T.A., and Zevakin, I.A.

TITLE: Solubility of carbon oxysulphide in titanium tetrachloride

PERIODICAL: Zhurnal prikladnoy khimii, v. 34, no. 12, 1961, 2783 - 2784

TEXT: The study was carried out since no data regarding the solubility of carbon oxysulphide in $TiCl_4$ could be found in the literature. The knowledge of solubility is important since $TiCl_4$ used in metallurgy should contain no trace of COS which may degrade the mechanical properties of metals. Pure, dry COS, prepared by the action of H_2SO_4 on NH_4CNS, was used to saturate small quantities (5 - 7 ml) of $TiCl_4$, under atmospheric pressure. The temperatures were controlled thermostatically and were between 0° and 100°C. The solubilities were determined with an ИКС-12 (IKS-12) infra-red spectrometer using an LiF prism, by observing the COS absorption band at $\nu = 2043\ cm^{-1}$ in 0.01 cm layers of solutions saturated at dif-

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Solubility of carbon oxysulphide...

ferent temperatures. These observations were then compared to a calibration graph, prepared with $TiCl_4$ solutions of known COS content which showed a linear relationship between the optical density and COS concentration up to 0.075 % of the latter. Saturated solutions were, therefore, diluted before analysis with known volumes of pure $TiCl_4$ to lower the COS to 0.01 - 0.02 % by weight. It was found that the solubility of COS in $TiCl_4$ varies between 9.5 weight % at 0°C and 1.1 % at 100°C. Sensitivity of this method of analysis was 1.5 x 10-5 % and the relative error did not exceed 5 - 7 %. There are 2 figures, 1 table and 2 Soviet-bloc references.

ASSOCIATION: Vsesoyuznyy alyuminiyevo-magniyevyy institut (All-Union Insitute of Aluminum and Magnesium)

SUBMITTED: March 17, 1961

20284
S/075/61/016/005/005/010
B101/B110

5.5310

AUTHORS: Tsekhovol'skaya, D. I., and Zavaritskaya, T. A.

TITLE: Quantitative determination of some impurities in titanium tetrachloride by infrared spectroscopy

PERIODICAL: Zhurnal analiticheskoy khimii, v. 16, no. 5, 1961, 623 - 626

TEXT: Earlier papers (Zavodsk. laboratoriya, 25, 300 (1959); Tsvetnyye metally, no. 4, 58 (1960)) reported on the determination of $TiOCl_2$, $VOCl_3$, HCl, CCl_6, $COCl_2$, CO_2, and CCl_3COCl in $TiCl_4$ by infrared spectroscopy. The present paper describes the determination of thionyl chloride, phosphorus oxychloride, carbon disulfide, and silicon tetrachloride in $TiCl_4$. The optical density of $SOCl_2$ was measured at 1241 cm^{-1}, and the concentration was calculated from c = D/Kd, where c is the concentration, D is the optical density, and d is the thickness of the absorbing layer. The absorption coefficient K was 150 cm^{-1}. The determination can only be carried out in purified $TiCl_4$ which contains only traces of $SiCl_4$ (band at

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Quantitative determination of some ....

1222 cm^{-1}) and $POCl_3$ (bands at 1226 and 1264 cm^{-1}). The sensitivity is $1 \cdot 10^{-4}$%. CS_2 was determined from the intense 1520 cm^{-1} band; K = 780 cm^{-1}; sensitivity is $7 \cdot 10^{-6}$%. $POCl_3$ was determined from the 1226 cm^{-1} band (K = 80 cm^{-1}; sensitivity $1.6 \cdot 10^{-4}$%) and the 1264 cm^{-1} band (K = 139 cm^{-1}; sensitivity $1 \cdot 10^{-4}$%). $SOCl_2$ and $SiCl_4$ may be present in small amounts only. $SiCl_4$ was determined from the weak 1222 cm^{-1} band (K = 0.807 cm^{-1}) to avoid the use of the KBr prism required for the 607 cm^{-1} band. Sensitivity was $2 \cdot 10^{-2}$%. As the content of $TiOCl_2$, $SOCl_2$, and $POCl_3$ in commercial $TiCl_4$ does not exceed 0.2, 0.01, and 0.005%, respectively, these compounds do not interfere with the determination of $SiCl_4$. Linear calibration curves were plotted for all four compounds by means of standard solutions. The measurements were made with an ИКС-12 (IKS-12) spectrometer with NaCl prism. The relative errors were 3 - 7%. There are 5 figures, 1 table, and 8 references: 6 Soviet and 2 non-Soviet. The

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B101/B110

Quantitative determination of some ...

reference to the English-language publication reads as follows: Sheldon, J. C., Tyree, S. Y., JACS 81, 2290 (1959).

ASSOCIATION: Vsesoyuznyy alyuminiyevo-magniyevyy institut, Leningrad
(All-Union Institute of Aluminum and Magnesium, Leningrad)

SUBMITTED: April 18, 1960

Card 3/3

DELAROVA, N.I. (Leningrad); ZAVARITSKAYA, T.A. (Leningrad); ZEVAKIN, I.A. (Leningrad); TSEKHOVOLISKAYA, Z.I. (Leningrad)

Impurities in commercial titanium tetrachloride and their removal. Izv. AN SSSR. Otd. tekh. nauk. Met. i topl. no.4:33-38 Jl-Ag '60. (MIRA 13:9)

(Titanium chlorides--Spectra)
(Vapor liquid equilibrium)
(Leaching)

ZAVARITSKAYA, T. A.; TSEKHOVOL'SKAYA, D. I.

Determination of titanium oxychloride in titanium tetrachloride. Zhur. prikl. khim. 33 no.9:2139-2140 S '60. (MIRA 13:10)

1. Vsesoyuznyy alyuminiyevo-magniyevyy institut.
(Titanium chloride)

BAGAYEV, V. S.; BEROZASHVILI, Yu. N.; VUL, B. M.; ZAVARITSKAYA, Ye. I.; KELDYSH, L. V.; SHOTOV, A. P.

"About the energy spectrum of heavily doped GaAs."

report submitted to Intl Conf on Semiconductor Physics [Radiative Recombination Symp], Paris, 27-28 Jul 64.

ZAVARITSKAYA, Ye.p.; ZAVARITSKIY, A.N., akademik, redaktor; SUSLOVA, A.I., redaktor; TUMARKINA, F.A., tekhnicheskiy redaktor

[Volcanoes] Vulkany. Izd. 4-oe, Pod. red. A.N.Zavaritskogo. Moskva, Gos. izd-vo tekhniko-teoret. lit-ry, 1950. 45 p. (Nauchno-populiarnaia biblioteka, no.8) (MLRA 10:1)
(Volcanoes)

ZAVARITSKIY, I. V.

Indium

Properties of superconductive films of thallium and indium.
Dokl. An SSSR 85, No. 4, 1952.

Monthly List of Russian Accessions, Library of Congress,
November, 1952. UNCLASSIFIED.

ZAVARITSKIY, I. V.

Thallium

Properties of superconductive films of thallium and idium. Dokl. An SSSR, 85, No. 4, 1952.

Monthly List of Russian Accessions, Library of Congress, November, 1952. UNCLASSIFIED.

ZAVARITSKIY, I. V.

Electromagnetism

Properties of superconductive films of thalium and indium. Dokl. AN SSSR 85, no. 4, 1952

Monthly List of Russian Accessions, Library of Congress, November 1952. Unclassified.